CLAIMS

1. Method for producing a biomimetic membrane (10), characterised in that it comprises the following steps:

a) depositing, on at least one of the principal faces of a plate A of a micro-machinable material, a layer B comprising one or several strata each formed of a micro-machinable material,

b) forming one or several through holes (20) within layer B, each hole having a wall (21) formed of the material(s) of said layer B and a bottom (22) formed of the material of plate A,

c) depositing, on said layer B, the wall (21) and the bottom (22) of each hole, a layer C of a micro-machinable material, which closely hugs the wall and the bottom of said hole,

d) eliminating layer C from the underlying face of layer B and, at the centre of each hole, from the underlying face of plate A, while at the same time leaving a residue (23) of layer C on the wall of said hole(s), said residue delimiting a pore (24) in which the wall (25) is formed of the material of layer C and in which the bottom (26) is formed of the material of layer A, and

e) liberating at least the part of layer B in which are found one or several pores (24) formed in step d), by the partial or total elimination of plate A.

2. Method according to any of the previous claims, characterised in that layer B has a thickness of between around 5 nm and 5 µm.

3. Method according to claim 1 or claim 2, characterised in that the number of through holes (20) formed within layer B, is between 1 single hole and 100 million holes per mm^2 of surface area of layer B and, preferably, between 1 single hole and 20 million holes per mm^2 of surface area of layer B.

4. Method according to any of the previous claims, characterised in that the through hole(s) (20) formed in layer B are substantially cylindrical.

5. Method according to any of the previous claims, characterised in that the through hole(s) (20) formed in layer B are formed by a lithography followed by an etching, preferably dry etching.

6. Method according to any of the previous claims, characterised in that step b) comprises an anisotropic etching of layer C.

7. Method according to claim 6, characterised in that the anisotropic etching of layer C is a reactive ion etching.

8. Method according to any of the previous claims, characterised in that step e) comprises the total elimination of plate A.

9. Method according to any of claims 1 to 7, characterised in that step e) comprises the following steps:

e_1) fastening, on the free face of layer B, a plate A' of a micro-machinable material, and

e_2) hollowing out plates A and A' so as to liberate the part of layer B in which are found the pore(s), while at the same time leaving the edges of said plates as well as a part of their face opposite to that situated in contact with said layer B.

10. Method according to claim 9, characterised in that plates A and A' are formed of the same material and are covered, on their face opposite to that situated in contact with layer B, with a layer D or micro-machinable material.

11. Method according to claim 9 or 10, characterised in that step e_2) comprises:

- a lithography followed by a wet or dry etching to partially eliminate layers D,
- a wet etching to hollow out plates A and A' while at the same time leaving a residue of said plates which covers layer B, and
- a dry etching to liberate the part of layer B in which are found one or several pores.

12. Method according to any of the previous claims, characterised in that layer B comprises a single stratum and in that said stratum is formed of a

micro-machinable material different to that forming layer C.

13. Method according to any of claims 1 to 11, characterised in that layer B comprises two strata and in that said strata are formed of two micro-machinable materials different to each other and different to that forming layer C.

14. Method according to any of the previous claims, characterised in that the micro-machinable materials forming plates A and A', layer B and layer C are chosen from among silicon, polycrystalline silicon, silica, silicon oxide and silicon nitride.

15. Method according to any of the previous claims, characterised in that it comprises, after step e), a step of functionalising the wall of the pore(s) (24) and/or the portions of the principal faces of the membrane which are not occupied by said wall.

16. Method according to claim 15, characterised in that the functionalising step comprises a functionalisation of the wall of the pore(s) (24) and a functionalisation of the portions of the principal faces of the membrane which are not occupied by said wall, said functionalisations being different to each other.

17. Biomimetic membrane (10) with one or several through pores (24), characterised in that it is formed

of at least two different micro-machinable materials, one of which forms the wall (23) of said pore(s), whereas the other material(s) form the remainder of said membrane.

18. Biomimetic membrane (10) according to claim 17, characterised in that it has a surface area of between around 1 μm^2 and 1 cm^2.

19. Biomimetic membrane (10) according to claim 17 or claim 18, characterised in that it has a thickness of between around 5 nm and 5 µm.

20. Biomimetic membrane (10) according to any of claims 17 to 19, characterised in that it has only one pore or a plurality of pores that may reach 100 million pores per mm^2 of surface area and, preferably, from 1 single pore to 20 million pores per mm^2 of surface area.

21. Biomimetic membrane (10) according to any of claims 17 to 20, characterised in that the pore(s) (24) that it comprises are substantially cylindrical and have a diameter of between 5 and 500 nm.

22. Biomimetic membrane (10) according to any of claims 17 to 21, characterised in that it is formed of two or three different micro-machinable materials.

23. Biomimetic membrane (10) according to any of claims 17 to 22, characterised in that the materials

forming it are chosen from among silicon, polycrystalline silicon, silica, silicon oxide and silicon nitride.

24. Biomimetic membrane (10) according to any of claims 17 to 23, characterised in that it is integral with two chambers (26, 27) which are arranged on either side of said membrane, which have a base, a lateral wall and a wall opposite said base, and in which said base is formed of said membrane, whereas their wall opposite said base is provided with an opening (28, 29).

25. Biomimetic membrane (10) according to claim 24, characterised in that the lateral wall of the chambers (26, 27) and the wall of said chambers that is opposite their base are formed of a micro-machinable material.

26. Biomimetic membrane (10) according to claim 25, characterised in that said micro-machinable material is chosen from among silicon, polycrystalline silicon, silica, silicon oxide and silicon nitride.

27. Biomimetic membrane (10) according to any of claims 17 to 26, characterised in that the wall of the pore(s) bears chemical and/or biochemical functions different to those borne by the portions of its principal faces which are not occupied by said wall.

28. Application of a biomimetic membrane (10) according to any of claims 17 to 27 to performing studies on the dynamic and functional properties of biological membranes.

29. Application of a biomimetic membrane (10) according to any of claims 17 to 27 to the manufacture of biocatalysis microsystems or the detection or dosing of substances.